



SIGMONA

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Project Websites

www.celticplus.eu/project-sigmona/
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SDN Concept in Generalized Mobile Network Architectures

The scope of the project was virtual mobile networks with software defined networking (SDN) in cloud. The project integrated the concepts of SDN and network functions virtualization (NFV) into LTE (4G) mobile networks with specific focus on flexible end-to-end SDN/NFV architecture, efficient backhaul network, optimized mobility management, dynamic resource management and improved security.

Main focus

Traffic volumes in mobile networks are increasing and end-user needs are changing rapidly. Mobile network operators need more flexibility, lower network operating costs, faster service roll-out cycles and new revenue sources. One answer to this call is the combination of software-defined networking (SDN) and network functions virtualization (NFV). The first means the separation of the control plane from the data plane in networking equipment. The latter refers to executing the control (and management) plane functions in virtual machines using cloud computing to support the execution

The SDN/NFV architecture is assumed to lower the initial network investment, ener-

gy consumption and network management costs for the operators. At the same time, SDN/NFV encourages openness and competition, as well as promotes new investments into the mobile connectivity and content industry. In addition, SDN changes the competitive advantage of the different operator types (e.g. incumbent, challenger, global hub, virtual, infrastructure, cloud/non-cloud) with each other and with the infrastructure providers.

Approach

The project integrated the concepts of SDN and NFV into LTE mobile networks. Cloud computing platforms and Open Source software were applied on the mobile networks with SDN and NFV. These technologies were applied in the 4G/LTE networks, and their further evolution to the forthcoming 5G networks was also studied.

The project studied the research areas associated with the Software Defined Mobile Networks which contributed to the network architecture definition. The virtual mobile network architecture concepts designed for the telco Cloud computing environments, as well as NFV and SDN princi-

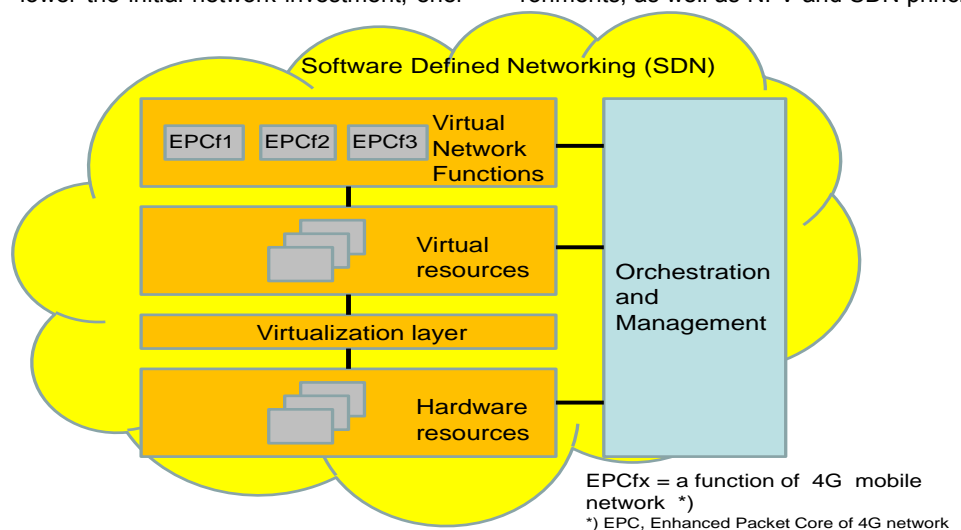


Figure 1: Software Define Mobile Network concept with virtual resources and SDN.

ples were validated with a number of Proof-of-Concept and test systems implementations. Joint national SDN-based test networks developed and deployed for shared experimentation environments.

The project followed the ETSI Industry Specification Group NFV (Network Functions Virtualization) principles, and also contributed to this key standardization activity on the future virtualized networks.

Dissemination of project results was actively done by submitting papers to scientific conferences. The Proof-of-Concepts were demonstrated in several public exhibitions.

Achieved results

Standardization contributions were provided to ETSI Industry Specification Group NFV, including a Proof-of-Concept system implementation. Open Source software was submitted to the OpenStack cloud platform.

The project implemented validation and test systems. Cooperation took place both nationally and between two countries to implement joint, national test systems/networks.

The project has demonstrated validation systems in the major mobile conferences, the most high profile of those being the Mobile

World Congress 2015 and 2016 in Barcelona, Spain.

The total of 70 publications and conference presentations highlight the academic qualifications of the project work. One Best Paper Award at 9th International Conference on Next Generation Mobile Applications, Services and Technologies (NGMAST 2015), Cambridge, UK, Sept 2015 with the paper "Security for Future Software Defined Mobile Networks" was received.

A book on the Software Defined Mobile Networks (SDMN) was edited and published (John Wiley & Sons Ltd. ISBN-13: 978-1118900284) largely based on the work and contributions by the project partners.

A SIGMONA White Paper "Software-Defined and Virtualized Mobile Networks" was published to summarize the key results of the project for the internal and external interest groups.

The SDN/NFV architecture concepts align with the forthcoming 5G mobile network concepts, thus serving as the baseline for the research and definition of the 5G networks.

Impact

The project was carried out in parallel with the major industry initiative on Network Functions Virtual-

ization (NFV) by ETSI Industry Specification Group (ISG) NFV. The NFV model and principles were applied as the baseline architecture. This enabled contributions to support the ETSI ISG NFV standards.

New business opportunities in the form of several new or improved products for the virtualized 4G/LTE networks were developed. The project results and the product concepts can be applied in the global 4G/LTE networks market. The novel key technologies for NFV and SDN based mobile networks and management systems were addressed, and thus the return on investment (RoI) from the project can be high.

The high number of scientific publications supported a number of PhD and Master's Thesis works, and thus creation of world class competence on the future 4G and 5G virtualized mobile networks technologies.

The project results will further evolve for the 5G mobile networks, and thus they can be used as a baseline for the 5G networks research in the 5GPPP of the EU Horizon 2020 and other 5G research.

About Celtic-Plus

Celtic-Plus is an industry-driven European research initiative to define, perform and finance through public and private funding common research projects in the area of telecommunications, new media, future Internet, and applications & services focusing on a new „Smart Connected World“ paradigm. Celtic-Plus is a EUREKA ICT cluster and belongs to the inter-governmental EUREKA network. Celtic-Plus is open to any type of company covering the Celtic-Plus research areas, large industry as well as small companies

or universities and research organisations. Even companies outside the EUREKA countries may get some possibilities to join a Celtic-Plus project under certain conditions.

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